

FD200

HIGH SPEED, HIGH CONDUCTANCE PLANAR DIODE

The **FD200** is a high conductance ultra fast planar diode. This device couples high speed with high conductance and high breakdown voltage, and enables the designer to choose a diode with planar reliability to fulfill most general purpose and switching applications.

MAXIMUM RATINGS (25°C) (Note 1)

WIV	Working Inverse Voltage	150 V
I_o	Average rectified current	100 mA
I_F	Forward current steady state d.c.	150 mA
i_r	Recurrent peak forward current	300 mA
i_r (surge)	Peak forward surge current pulse width of 1.0 second	500 mA
i_r (surge)	Peak forward surge current pulse width of 1.0 μ Sec.	2000 mA
P	Power dissipation	500 mW
1/θ	Power derating factor	4 mW/°C
T_A	Operating temperature	-65°C to +150°C
T_{stg}	Storage temperature, ambient	-65°C to +175°C

PHYSICAL DIMENSIONS



NOTES: All dimensions in inches.
See note 4.
Weight: 0.25 gram.

ELECTRICAL SPECIFICATIONS (25°C unless otherwise noted)

Symbol	Characteristic	Min.	Max.	Units	Test Conditions
V_F	Forward Voltage		1.0	V	I _F = 100 mA
I_R	Reverse Current		0.1	μ A	V _R = 150 V
I_R	Reverse Current (150°C)		100	μ A	V _R = 150 V
BV	Breakdown Voltage	200		V	I _R = 100 μ A
t_{rr}	Reverse Recovery Time		50	nSec	See Table III
C_o	Capacitance (Note 2)		5.0	pf	V _R = 0 V, f = 1 mc
RE	Rectification Efficiency (Note 3)	35		%	f = 100 mc

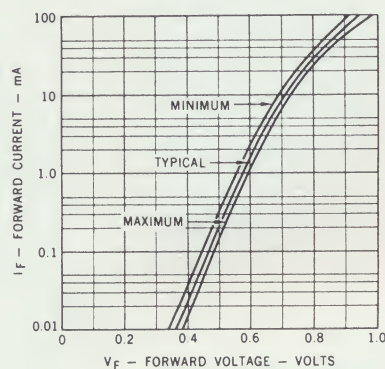
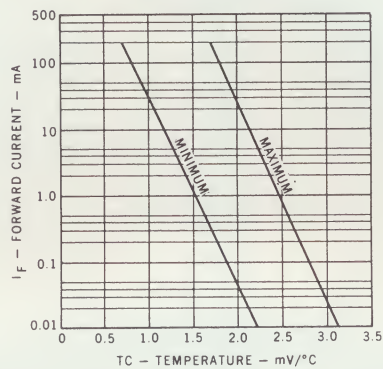
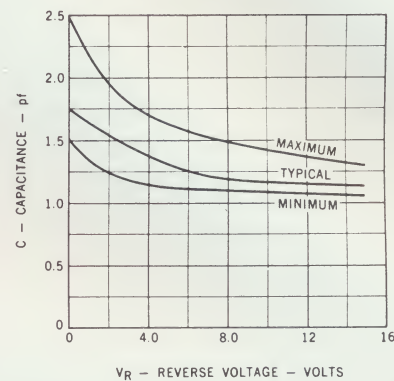
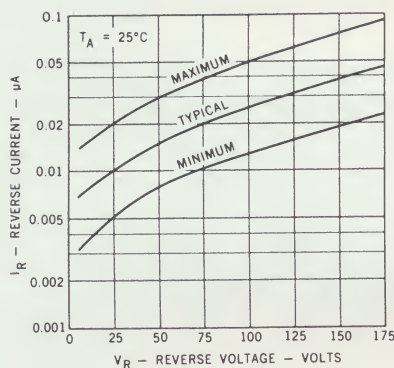
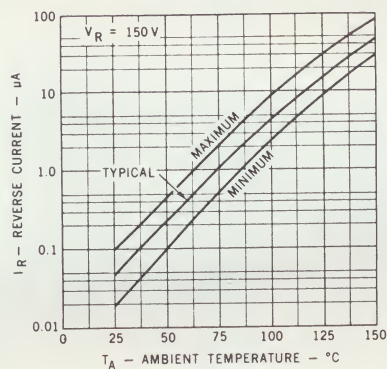
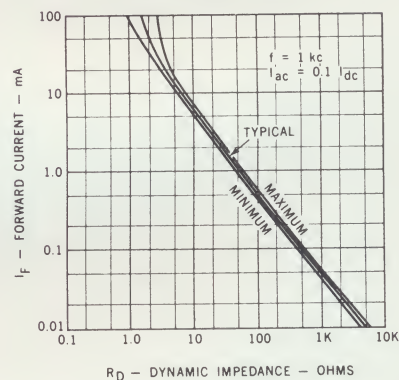
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NOTES:

- (1) The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
- (2) Capacitance as measured on Boonton Electronic Corporation Model No. 75A-S8 Capacitance Bridge or equivalent.
- (3) Rectification efficiency is defined as the ratio of D.C. load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V r.m.s. input to the circuit. Load resistance 5.0 K ohms, load capacitance 20 μ f.
- (4) Leads are tinned. Gold plate with nickel strike may be obtained when specified.

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TYPICAL ELECTRICAL CHARACTERISTICS

FORWARD VOLTAGE VERSUS
FORWARD CURRENTFORWARD CURRENT VERSUS
TEMPERATURE COEFFICIENTCAPACITANCE VERSUS
REVERSE VOLTAGEREVERSE VOLTAGE VERSUS
REVERSE CURRENTREVERSE CURRENT VERSUS
AMBIENT TEMPERATUREDYNAMIC IMPEDANCE VERSUS
FORWARD CURRENT

POWER DERATING CURVE

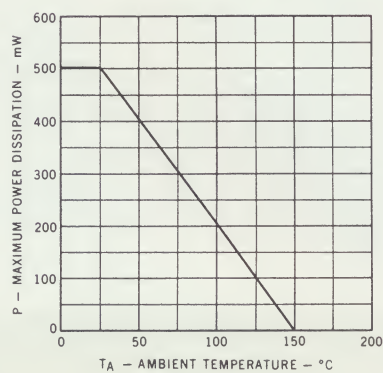
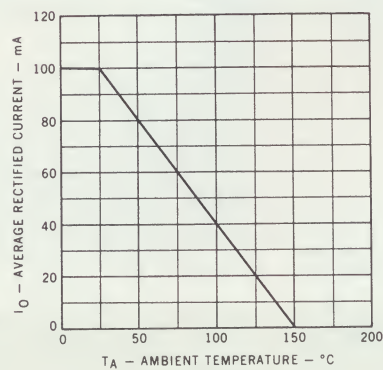
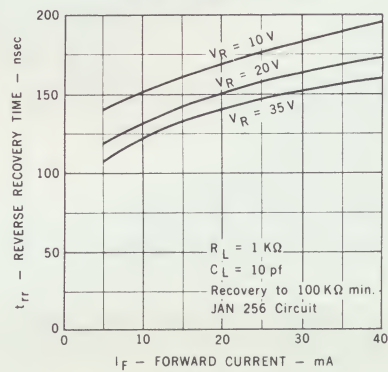
AVERAGE RECTIFIED CURRENT
VERSUS AMBIENT TEMPERATUREREVERSE RECOVERY TIME VERSUS
FORWARD CURRENT AND
REVERSE BIAS VOLTAGE

TABLE IV — GROUP B INSPECTION

MIL-STD-750 Ref. Para.	Examination or Test	Conditions (T _A = 25°C, unless otherwise specified)	Min. Sample Size	Min. Accept No.	
2066 & 2071	Subgroup I Visual and Mechanical Examination		260	0	
2026 & 2031	Subgroup II Solder	15 seconds immersion @ 230°C	25	0	
1051 Condition C	Temperature Cycling	−65°C to +200°C, 10 cycles, 25 minutes @ extreme cycle			
1056 Condition A	Thermal Shock	Water @ 0°C to 100°C, 10 cycles, 30 sec. @ extreme cycle			
1021	Moisture Resistance	MIL-STD			
2016	Subgroup III Shock	3 planes; 3 blows per plane; 0.5 mSec 1500 G	25	0	
2006	Constant Acceleration	20,000 G, orientation of X _I , Y _I , Z _I , and Z _I			
2046	Vibration Fatigue	20 G, 40 CPS, 96 hours, 3 orientations			
2056	Vibration Variable Frequency	100-2,000-100 CPS, 20 G peak acceleration, 3 orientations			
2036 Condition E	Subgroup IV Lead Fatigue	1 pound, 3-90° arcs	25	0	
2036 Condition A	Tension Test	3-pound weight for 30 seconds			
	Seal Test	100 PSIG hydraulic test, 2 hours			
1041 & 1046	Subgroup V Salt Spray	MIL-STD	25	0	
1031	Subgroup VI High Temperature Life	T _A = 150°C, 1000 hours	80	1	
1026	Subgroup VII Operational Life	V _{RMS} = 106, I _o = 100 mAdc	80	1	
End Points: Subgroups II through V		Symbol	Limits		Unit
			Min.	Max.	
4011	Forward Voltage	I _F = 100 mAdc	V _F	1.0	Vdc
4016	Reverse Current	V _R = 150 Vdc	I _R	0.1	μAdc
4001	Capacitance	VR = 0, f = 1.0 mc	C	5.0	pf
End Points: Subgroups VI and VII					
4011	Forward Voltage	I _F = 100 mAdc	V _F	1.05	Vdc
4016	Reverse Current	V _R = 150 Vdc	I _R	0.2	μAdc
4001	Capacitance	V _R = 0, f = 1.0 mc	C	8.0	pf

NOTE TO BUYERS:

This document is a complete procurement specification known as FACT, which can be referred to as a purchase contract. It provides the options shown in Table I. The FACT Program is the customer's assurance of a continuing line audit testing program designed to analyze and guarantee the reliability of Fairchild diodes. Weekly samples from the production line are accumulated on a daily basis and subjected to a series of environmental tests, as described in Table IV. The resulting data is then programmed in a computer and various statistical measurements are made and compared with pre-test readings as well as historical line data.

Participants in the FACT Program are assured of:

- Low-cost reliability data. The cost of the program is borne by many purchasers instead of one.
- Availability. The entire product line is tested continuously, providing off-the-shelf delivery.

1.0 SCOPE

This specification covers detailed procurement requirements for high reliability silicon planar diodes. These devices are suitable for use in space vehicles and are capable of operation under the most stringent environmental conditions.

2.0 FAILURE RATES

The acceptance conditions for operational life, storage life, and environmental tests are assured by actual test. The estimated failure rate in conservatively designed circuits is based on engineering judgment and the relationship to devices actually tested by Fairchild. These tests indicate the feasibility of attaining a failure rate better than .001% per thousand hours. The vendor is not required to demonstrate this failure rate on devices shipped.

3.0 APPLICABLE DOCUMENTS

3.1 Testing Procedures: Test procedures shall conform to MIL-S-19500 and MIL-STD-750.

3.2 Sampling Procedures: Sampling procedures used are per MIL-S-19500, unless otherwise specified.

4.0 MISCELLANEOUS REQUIREMENTS

4.1 Packaging: Devices shall be packed in the vendor's standard package unless otherwise specified on the purchase order.

5.0 QUALITY AND RELIABILITY ASSURANCE PROVISIONS

5.1 100% Processing Steps: See Table II.

5.2 Normal Lot Acceptance: Each lot of devices shipped shall meet the requirements of Table III, Group A Inspection. Parts purchased as FD200-1 or FD200-3 shall be accompanied by attribute data; those purchased as FD200-2 or FD200-4 shall be accompanied by variables data. The data supplied is from the latest production lot submitted to Table IV, Group B Inspection.

6.0 DEFINITIONS

6.1 LTPD (Lot Tolerance Percent Defective): This parameter of a sampling plan is the maximum percent defective which will be accepted by the sampling plan with 90% confidence.

6.2 Burn-In: Devices which are ordered as FD200-3 or FD200-4 will have been operated for 100 hours as listed in Table II, prior to Group A Inspection.

TABLE I

Part Number	Option (See paragraph 5.2)
FD200	Units supplied without data.
FD200-1	Units supplied with data summary by attributes.
FD200-2	Units supplied with variables data and statistical summary.
FD200-3	Units supplied with 100-hour burn-in as a process step and with data summary by attributes.
FD200-4	Units supplied with 100-hour burn-in as a process step and with variables data and statistical summary.

TABLE II — 100% PROCESSING

Test	Examination or Test	Conditions
1	High Temperature Stabilization	200°C min., 250 hours min.
2	Temperature Cycle	10 cycles 175°C to -65°C
3	Hermetic Seal	Hydraulic pressure of 100 PSIG for 2 hours (alcohol, water, and dye)
4	100-hour Burn-In (See note below)	$V_{RMS} = 106$, $I_o = 100$ mAdc, $T_A = 25^\circ\text{C}$

NOTE: FD200-3 and FD200-4 only.

TABLE III — GROUP A INSPECTION

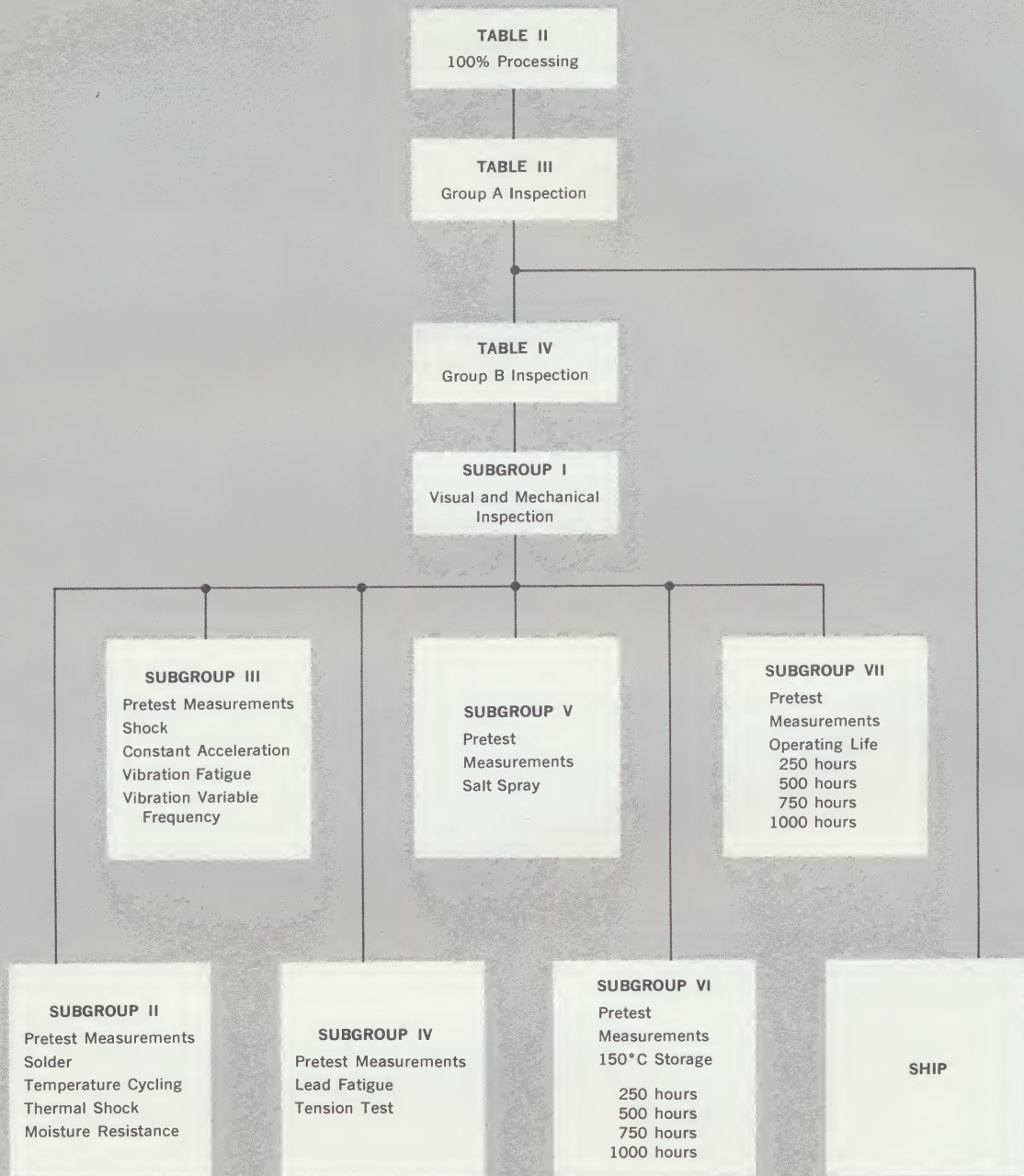
ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

SYMBOL	CHARACTERISTICS	LIMITS		Units	SAMPLING LTPD %	TEST CONDITIONS	MIL-STD
		Min.	Max.				750 Ref. Para.
SUBGROUP I					7		
	Visual and Mechanical examination						2071
SUBGROUP II					7		
V _F	Forward Voltage		1.0	Vdc		I _F = 100 mAdc	4011
BV	Breakdown Voltage	200		Vdc		I _R = 100 μAdc	4021
I _R	Reverse Current		100	nAdc		V _R = 150 Vdc	4016
SUBGROUP III					10		
I _R	Reverse Current		100	μAdc		V _R = 150 Vdc T _A = 150°C	4016
C	Capacitance		5.0	pf		V _R = 0 f = 1.0 mc	4001
t _{rr}	Reverse Recovery Time		50	nSec		I _f = I _r = 30 mA RL = 100 ohms Recovery to 1 mA	4031

TABLE IV — GROUP B INSPECTION

MIL-STD-750 Ref. Para.	Examination or Test	Conditions (T _A = 25°C, unless otherwise specified)	Min. Sample Size	Min. Accept No.	
2066 & 2071	Subgroup I Visual and Mechanical Examination		260	0	
2026 & 2031	Subgroup II Solder	15 seconds immersion @ 230°C	25	0	
1051 Condition C	Temperature Cycling	−65°C to +200°C, 10 cycles, 25 minutes @ extreme cycle			
1056 Condition A	Thermal Shock	Water @ 0°C to 100°C, 10 cycles, 30 sec. @ extreme cycle			
1021	Moisture Resistance	MIL-STD			
2016	Subgroup III Shock	3 planes; 3 blows per plane; 0.5 mSec 1500 G	25	0	
2006	Constant Acceleration	20,000 G, orientation of X _i , Y _i , Z ₂ , and Z ₁			
2046	Vibration Fatigue	20 G, 40 CPS, 96 hours, 3 orientations			
2056	Vibration Variable Frequency	100-2,000-100 CPS, 20 G peak acceleration, 3 orientations			
2036 Condition E	Subgroup IV Lead Fatigue	1 pound, 3-90° arcs	25	0	
2036 Condition A	Tension Test	3-pound weight for 30 seconds			
	Seal Test	100 PSIG hydraulic test, 2 hours			
1041 & 1046	Subgroup V Salt Spray	MIL-STD	25	0	
1031	Subgroup VI High Temperature Life	T _A = 150°C, 1000 hours	80	1	
1026	Subgroup VII Operational Life	V _{RMS} = 106, I _o = 100 mAdc	80	1	
End Points: Subgroups II through V		Symbol	Limits		Unit
			Min.	Max.	
4011	Forward Voltage	I _F = 100 mAdc	V _F	1.0	Vdc
4016	Reverse Current	V _R = 150 Vdc	I _R	0.1	μAdc
4001	Capacitance	VR = 0, f = 1.0 mc	C	5.0	pf
End Points: Subgroups VI and VII					
4011	Forward Voltage	I _F = 100 mAdc	V _F	1.05	Vdc
4016	Reverse Current	V _R = 150 Vdc	I _R	0.2	μAdc
4001	Capacitance	V _R = 0, f = 1.0 mc	C	8.0	pf

PRODUCTION FLOW CHART



Fairchild cannot assume responsibility for use of any circuitry described. No circuit patent licenses are implied.

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FD100

ULTRA-FAST PLANAR DIODE

MAXIMUM RATINGS (25°C.) [Note 1]

WIV	- Working Inverse Voltage	50 V
I_O	- Average rectified current	75 mA
I_F	- Forward current steady state d. c.	115 mA
i_f	- Recurrent peak forward current	225 mA
i_f (surge)	- Peak forward surge current pulse width of 1 second	500 mA
i_f (surge)	- Peak forward surge current pulse width of 1 microsecond	2000 mA
P	- Power dissipation	250 mW
$\frac{1}{\theta}$	- Power derating factor	1.67 mW/°C
T_A	- Operating temperature	-65° to +175°C
T_{stg}	- Storage temperature, ambient	-65° to +200°C

PHYSICAL DIMENSIONS



NOTE: ALL DIMENSIONS IN INCHES

ELECTRICAL SPECIFICATIONS (25° C unless otherwise noted)

SYMBOL	CHARACTERISTIC	MIN.	TYPICAL	MAX.	TEST CONDITIONS
V_F	Forward Voltage			1.0 V	$I_F = 10 \text{ mA}$
I_R	Reverse Current			0.1 μA	$V_R = 50 \text{ V}$
I_R	Reverse Current (150° C)			100 μA	$V_R = 50 \text{ V}$
BV	Breakdown Voltage	75V			$I_R = 5 \mu\text{A}$
t_{rr} [Note 2]	Reverse Recovery Time			4.0 nsec	$I_f = 10 \text{ mA}$ $I_r = 10 \text{ mA}$ $R_L = 100 \Omega$
t_{rr} [Note 2]	Reverse Recovery Time			2.0 nsec	$I_f = 10 \text{ mA}$ $V_r = 6.0 \text{ V}$ $R_L = 100 \Omega$
C_o [Note 3]	Capacitance			2.0 pf	$V_R = 0 \text{ V}$ $f = 1 \text{ mc}$
RE	Rectification Efficiency	45%			100 mc [Note 4]
$\Delta V_F / ^\circ\text{C}$	Change of forward voltage per degree change in temperature		-1.8 mV		

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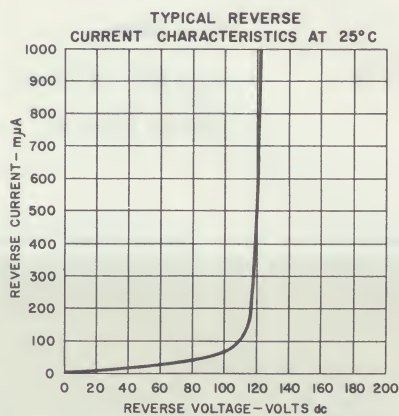
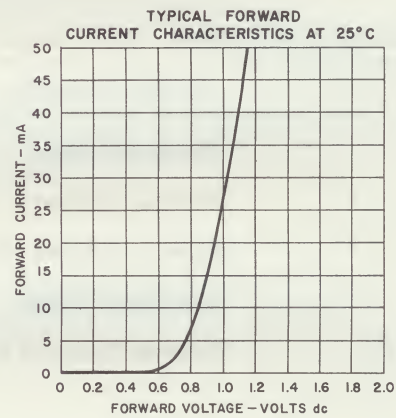
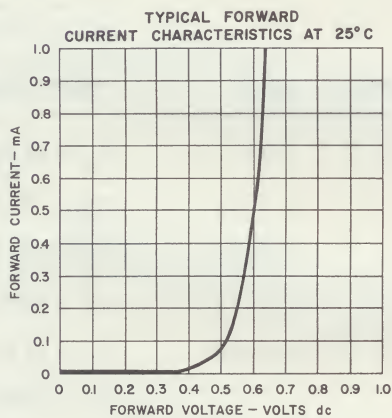
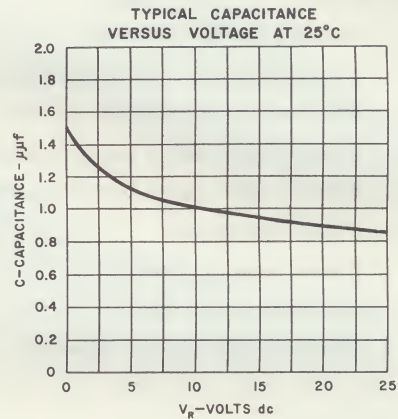
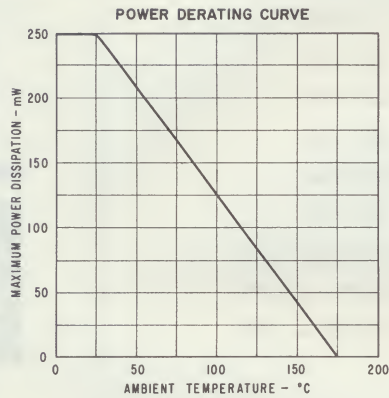
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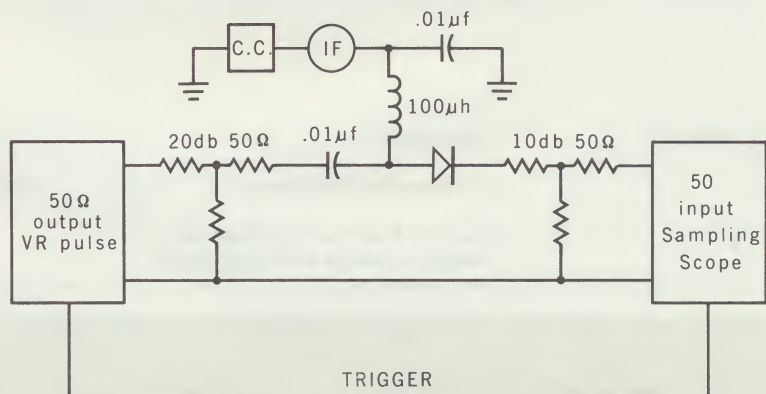
NOTES:

- (1) The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
- (2) Recovery to 1 mA in circuit shown on page 2 of data sheet.
- (3) Capacitance as measured on Boonton Electronic Corporation Model No. 75A-S8 Capacitance Bridge or equivalent.
- (4) Rectification efficiency is defined as the ratio of D.C. load voltage to peak rf input voltage to the detector circuit, measured with 2.0 V r.m.s. input to the circuit. Load resistance 5 K ohms, load capacitance 20 μ f.

TYPICAL ELECTRICAL CHARACTERISTICS



REVERSE RECOVERY TEST CIRCUIT



VR pulse risetime $\leq .25$ nsec

Scope risetime $\leq .35$ nsec

1N3595**HIGH CONDUCTANCE LOW LEAKAGE PLANAR DIODE**

REGISTERED SPECIFICATIONS

The 1N3595 is a high conductance extremely low leakage planar diode. Specified maximum values for voltage drop capacitance and leakage current mean flexibility in designing circuits which require large numbers of diodes. In those applications where reverse current is a critical design parameter, the inherent qualities of the Fairchild process eliminates the problem of leakage degradation.

The USN 1N3595 is supplied in accordance with MIL-S-19500/241A (NAVY). The electrical specifications, as listed in Table III, are identical with those listed in this Military Specification.

MAXIMUM RATINGS (25°C) (Note 1)

WIV	Working Inverse Voltage	125 V
I_O	Average rectified current	150 mA
I_F	Forward current steady state d.c.	225 mA
i_r	Recurrent peak forward current	450 mA
i_r (surge)	Peak forward surge current pulse width of 1 second	500 mA
i_r (surge)	Peak forward surge current pulse width of 1 μ Sec.	4000 mA
P	Power dissipation	500 mW
1/θ	Power derating factor	4 mW/°C
T_A	Operating temperature	-65°C to +150°C
T_{stg}	Storage temperature, ambient	-65°C to +175°C

PHYSICAL DIMENSIONS

NOTE: All dimensions in inches. See note 2

ELECTRICAL SPECIFICATIONS (25°C unless otherwise noted)

Symbol	Characteristic	Min.	Max.	Units	Test Conditions
V_{F1}	Forward Voltage	.83	1.00	Vdc	$I_F = 200$ mA
V_{F2}	Forward Voltage	.79	.92	Vdc	$I_F = 100$ mA
V_{F3}	Forward Voltage	.74	.88	Vdc	$I_F = 50$ mA
V_{F4}	Forward Voltage	.65	.80	Vdc	$I_F = 10$ mA
V_{F5}	Forward Voltage	.60	.75	Vdc	$I_F = 5$ mA
V_{F6}	Forward Voltage	.52	.68	Vdc	$I_F = 1$ mA
I_{R1}	Reverse Current		1.0	nA	$V_R = 125$ V
I_{R2}	Reverse Current (125°C)		300	nA	$V_R = 30$ V
I_{R3}	Reverse Current (125°C)		500	nA	$V_R = 125$ V
I_{R4}	Reverse Current (150°C)		3.0	μ A	$V_R = 125$ V
t_{rr}	Reverse Recovery Time		3.0	μ Sec	See Table III
C	Capacitance [Note 3]		8.0	pf	$V_R = 0$ V
BV	Breakdown Voltage	150		Vdc	$I_R = 100$ μ A

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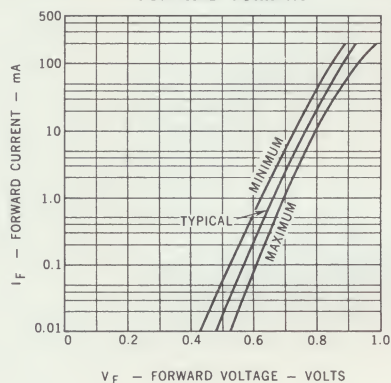
NOTES:

- (1) The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
- (2) Leads are tinned. Gold plate with nickel strike may be obtained when specified.
- (3) Capacitance as measured on Boonton Electronic Corporation's Model No. 75A-S8 Capacitance Bridge or equivalent.

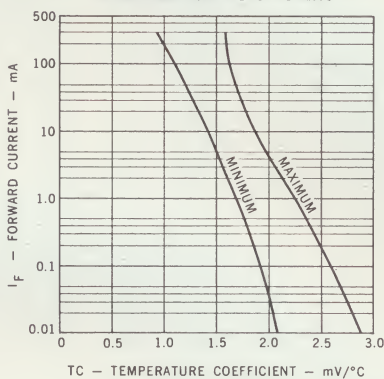
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TYPICAL ELECTRICAL CHARACTERISTICS

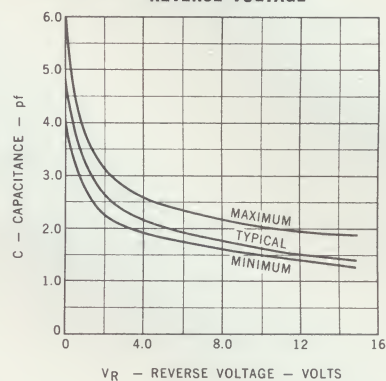
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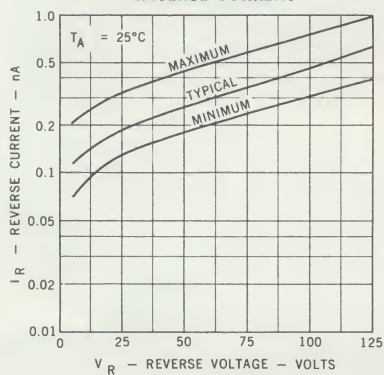
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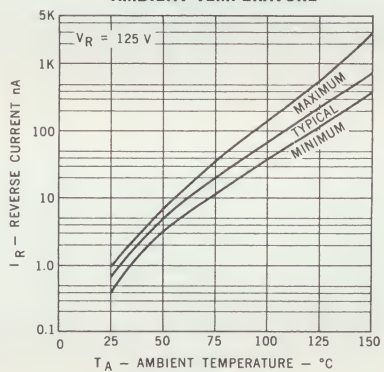
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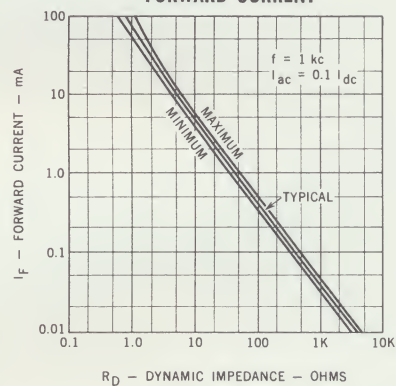
REVERSE VOLTAGE VERSUS REVERSE CURRENT



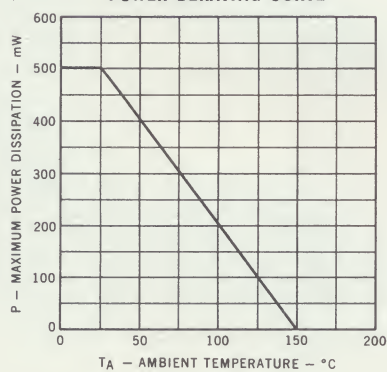
REVERSE CURRENT VERSUS AMBIENT TEMPERATURE



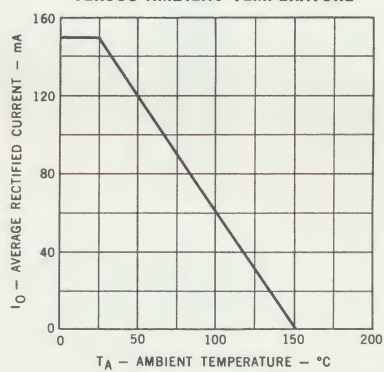
DYNAMIC IMPEDANCE VERSUS FORWARD CURRENT



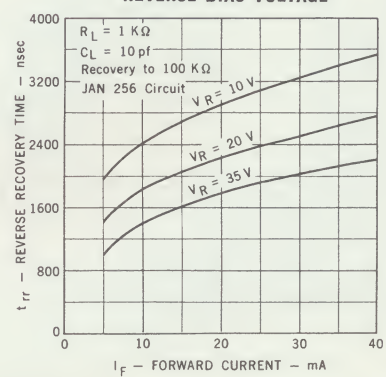
POWER DERATING CURVE



AVERAGE RECTIFIED CURRENT VERSUS AMBIENT TEMPERATURE



REVERSE RECOVERY TIME VERSUS FORWARD CURRENT AND REVERSE BIAS VOLTAGE



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3.0 APPLICABLE DOCUMENTS

3.1 Testing Procedures: Test procedures shall conform to MIL-S-19500 and MIL-STD-750.

3.2 Sampling Procedures: Sampling procedures used are per MIL-S-19500, unless otherwise specified.

4.0 MISCELLANEOUS REQUIREMENTS

4.1 Packaging: Devices shall be packed in the vendor's standard package unless otherwise specified on the purchase order.

5.0 QUALITY AND RELIABILITY ASSURANCE PROVISIONS

5.1 100% Processing Steps: See Table II.

5.2 Normal Lot Acceptance: Each lot of devices shipped shall meet the requirements of Table III, Group A Inspection. Parts purchased as 1N3595-1 or 1N3595-3 shall be accompanied by attribute data; those purchased as 1N3595-2 or 1N3595-4 shall be accompanied by variables data. The data supplied is from the latest production lot submitted to Table IV, Group B Inspection.

6.0 DEFINITIONS

6.1 LTPD (Lot Tolerance Percent Defective): This parameter of a sampling plan is the maximum percent defective which will be accepted by the sampling plan with 90% confidence.

6.2 Burn-In: Devices which are ordered as 1N3595-3 or 1N3595-4 will have been operated for 100 hours as listed in Table II, prior to Group A Inspection.

TABLE I

Part Number	Option (See paragraph 5.2)
1N3595	Units supplied without data.
1N3595-1	Units supplied with data summary by attributes.
1N3595-2	Units supplied with variables data and statistical summary.
1N3595-3	Units supplied with 100-hour burn-in as a process step and with data summary by attributes.
1N3595-4	Units supplied with 100-hour burn-in as a process step and with variables data and statistical summary.

TABLE II—100% PROCESSING

Test	Examination or Test	Conditions
1	High Temperature Stabilization	200°C min., 250 hours min.
2	Temperature Cycle	10 cycles 175°C to -65°C
3	Hermetic Seal	Hydraulic pressure of 100 PSIG for 2 hours (alcohol, water, and dye)
4	100-Hour Burn-In (See note below)	V _{RMS} = 89, I _o = 150 mAdc, T _A = 25°C

NOTE: 1N3595-3 and 1N3595-4 only.

TABLE III—GROUP A INSPECTION

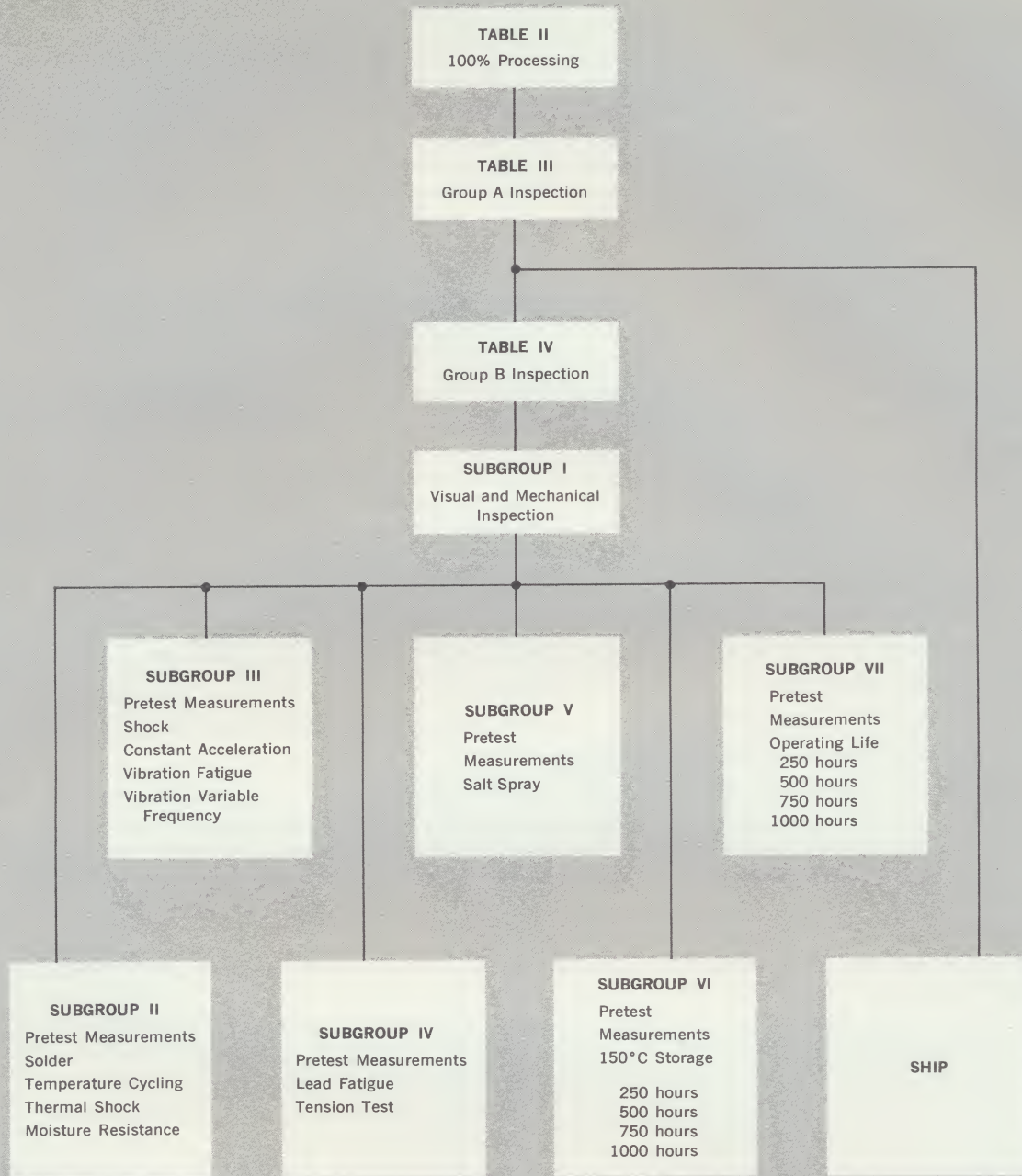
ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

SYMBOL	CHARACTERISTICS	LIMITS		Units	SAMPLING LTPD (λ) %	TEST CONDITIONS	MIL-STD 750 Method
		Min.	Max.				
SUBGROUP 1					5		
	Visual and Mechanical examination						2071
SUBGROUP 2					3		
V _{F1}	Forward Voltage	.83	1.0	Vdc		I _F = 200 mAdc	4011
V _{F2}	Forward Voltage	.79	.92	Vdc		I _F = 100 mAdc	4011
V _{F3}	Forward Voltage	.74	.88	Vdc		I _F = 50 mAdc	4011
V _{F4}	Forward Voltage	.65	.80	Vdc		I _F = 10 mAdc	4011
V _{F5}	Forward Voltage	.60	.75	Vdc		I _F = 5 mAdc	4011
V _{F6}	Forward Voltage	.52	.68	Vdc		I _F = 1 mAdc	4011
I _{R1}	Reverse Current	—	1.0	nAdc		V _R = 125 Vdc	4016
I _{R2}	Reverse Current	—	0.3	μ Adc		V _R = 30 Vdc T _A = 125°C	4016
I _{R3}	Reverse Current	—	0.5	μ Adc		V _R = 125 Vdc T _A = 125°C	4016
I _{R4}	Reverse Current	—	3.0	μ Adc		V _R = 125 Vdc T _A = 150°C	4016
C	Capacitance	—	8.0	pf		V _R = 0 f = 1.0 mc	4001
t _{rr}	Reverse Recovery Time	—	3.0	μ sec		I _F = 10 mA V _R = 35 V R _L = 1000 Ω rec to 100 K CL = 10 pf Jan 256	4031 Condition A
BV	Breakdown Voltage	150		Vdc		I _R = 100 μ A	4021

TABLE IV — GROUP B INSPECTION

MIL-STD-750 Ref. Para.	Examination or Test	Conditions (T _A = 25 °C, unless otherwise specified)		Min. Sample Size	Min. Accept No.	
2066 & 2071	Subgroup I Visual and Mechanical Examination			260	0	
2026 & 2031	Subgroup II Solder	15 seconds immersion @ 230°C		25	0	
1051 Condition C	Temperature Cycling	−65°C to +200°C, 10 cycles, 25 minutes @ extreme cycle				
1056 Condition A	Thermal Shock	Water @ 0°C to 100°C, 10 cycles, 30 sec. @ extreme cycle				
1021	Moisture Resistance	MIL-STD				
	Subgroup III			25	0	
2016	Shock	3 planes; 3 blows per plane; 0.5 mSec 1500 G				
2006	Constant Acceleration	20,000 G, orientation of X _i , Y _i , Y _z , and Z _i				
2046	Vibration Fatigue	20 G, 40 CPS, 96 hours, 3 orientations				
2056	Vibration Variable Frequency	100-2,000-100 CPS, 20 G peak acceleration, 3 orientations				
	Subgroup IV			25	0	
2036 Condition E	Lead Fatigue	1 pound, 3-90° arcs				
2036 Condition A	Tension Test	3-pound weight for 30 seconds				
	Seal Test	100 PSIG hydraulic test, 2 hours				
1041 & 1046	Subgroup V Salt Spray	MIL-STD		25	0	
	Subgroup VI			80	1	
1031	High Temperature Life	T _A = 150°C, 1000 hours				
	Subgroup VII			80	1	
1026	Operational Life	V _{RMS} = 89, I _o = 150 mAdc				
	End Points: Subgroups II through V:	Symbol	Limits		Unit	
			Min.	Max.		
4011	Forward Voltage	I _F = 200 mAdc	V _F	.83	1.0	Vdc
4016	Reverse Current	V _R = 125 Vdc	I _R		1.0	nA
4001	Capacitance	V _R = 0, f = 1 mc	C		8.0	pf
	End Points: Subgroups VI and VII:					
4011	Forward Voltage	I _F = 200 mAdc	V _F	.82	1.05	Vdc
4016	Reverse Current	V _R = 125 Vdc	I _R		2.0	nA
4001	Capacitance	V _R = 0, f = 1 mc	C		10.0	pf

PRODUCTION FLOW CHART



FAIRCHILD
SEMICONDUCTOR
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1N3600**HIGH CONDUCTANCE ULTRA FAST EPITAXIAL PLANAR DIODE**

REGISTERED SPECIFICATIONS

The 1N3600 is a silicon planar epitaxial diode that provides low capacitance, high conductance, and fast reverse recovery. With these features, the device is ideally suited for applications such as core devices, avalanche circuitry, logarithmic amplifiers for pulse applications and for any critical circuit requiring high conductance and low internal power dissipation without sacrifice of speed capabilities.

The USN 1N3600 is supplied in accordance with MIL-S-19500/231A (NAVY). The electrical specifications, as listed in Table III, are identical with those listed in this Military Specification.

MAXIMUM RATINGS (25°C) (Note 1)

WIV	Working Inverse Voltage	50 V
I_O	Average rectified current	200 mA
i_f	Recurrent peak forward current	600 mA
i_f (surge)	Peak forward surge current pulse width of 1 second	1 A
i_r (surge)	Peak forward surge current pulse width of 1 μ Sec.	4 A
P	Power dissipation	500 mW
1/θ	Power derating factor	4 mW/°C
T_A	Operating temperature	-65°C to +150°C
T_{stg}	Storage temperature, ambient	-65°C to +175°C

PHYSICAL DIMENSIONS

NOTE: All dimensions in inches. See note 3

ELECTRICAL SPECIFICATIONS (25°C unless otherwise noted)

Symbol	Characteristic	Min.	Max.	Units	Test Conditions
V_{F1}	Forward Voltage	.87	1.00	Vdc	$I_F = 200$ mA
V_{F2}	Forward Voltage	.82	.92	Vdc	$I_F = 100$ mA
V_{F3}	Forward Voltage	.76	.86	Vdc	$I_F = 50$ mA
V_{F4}	Forward Voltage	.66	.74	Vdc	$I_F = 10$ mA
V_{F5}	Forward Voltage	.54	.62	Vdc	$I_F = 1$ mA
I_{R1}	Reverse Current		0.1	μ A	$V_R = 50$ V
I_{R2}	Reverse Current (150°C)		100	μ A	$V_R = 50$ V
BV	Breakdown Voltage	75			$I_R = 5$ μ A
t_{rr1}	Reverse Recovery Time		4.0	nSec	See Table III
t_{rr2}	Reverse Recovery Time		6.0	nSec	See Table III
C_O	Capacitance [Note 2]		2.5	pf	$V_R = 0$ V, $f = 1$ mc

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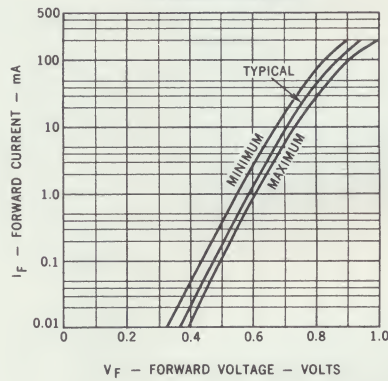
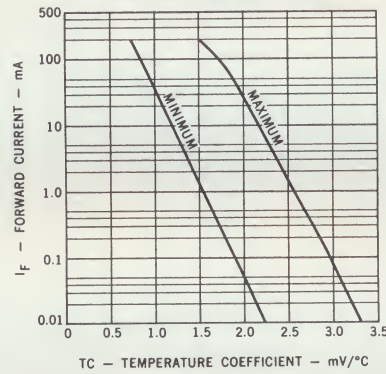
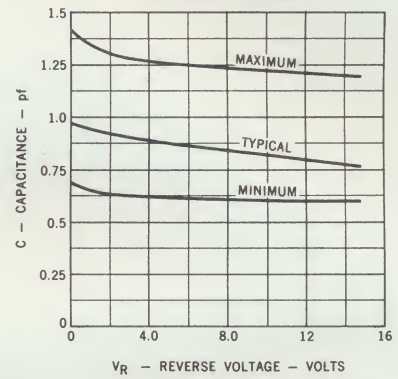
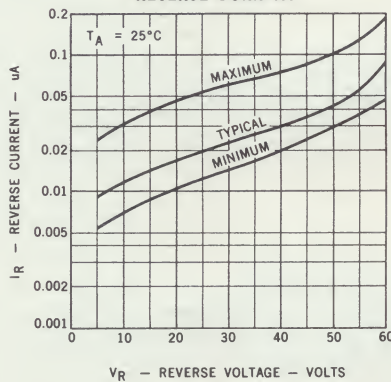
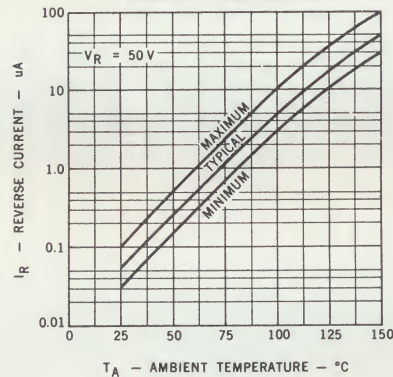
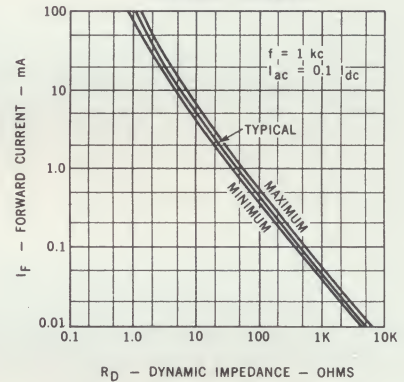
NOTES:

- (1) The maximum ratings are limiting values above which life or satisfactory performance may be impaired.
- (2) Capacitance as measured on Boonton Electronic Corporation Model No. 75-AS8 Capacitance Bridge or equivalent.
- (3) Leads are tinned. Gold plate with nickel strike may be obtained when specified.

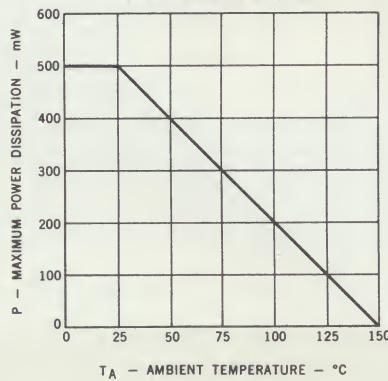
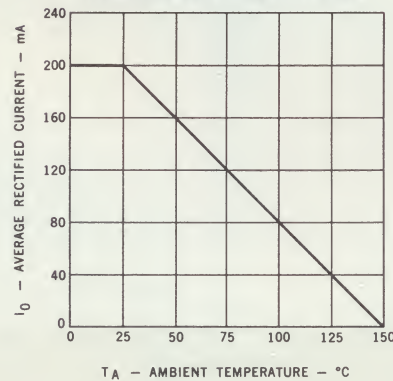
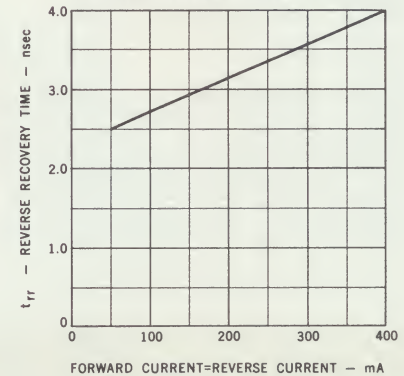
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MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2959681, 2971139, 2981877, 3013955, 3015048, 3025589, 3034106. OTHER PATENTS PENDING.

TYPICAL ELECTRICAL CHARACTERISTICS

FORWARD VOLTAGE VERSUS
FORWARD CURRENT

FORWARD CURRENT VERSUS
TEMPERATURE COEFFICIENT

CAPACITANCE VERSUS
REVERSE VOLTAGE

REVERSE VOLTAGE VERSUS
REVERSE CURRENT

REVERSE CURRENT VERSUS
AMBIENT TEMPERATURE

DYNAMIC IMPEDANCE VERSUS
FORWARD CURRENT


POWER DERATING CURVE


AVERAGE RECTIFIED CURRENT
VERSUS AMBIENT TEMPERATURE

REVERSE RECOVERY TIME
VERSUS FORWARD CURRENT ($I_F = I_R$)


NOTE TO BUYERS:

This document is a complete procurement specification known as **RECAP**, which can be referred to as a purchase contract. It provides the options shown in Table I. The **RECAP** Program is the customer's assurance of a continuing line audit testing program designed to analyze and guarantee the reliability of Fairchild diodes. Weekly samples from the production line are accumulated on a daily basis and subjected to a series of environmental tests, as described in Table IV. The resulting data is then programmed in a computer and various statistical measurements are made and compared with pre-test readings as well as historical line data.

Participants in the **RECAP** Program are assured of:

- Low-cost reliability data. The cost of the program is borne by many purchasers instead of one.
- Availability. The entire product line is tested continuously, providing off-the-shelf delivery.

1.0 SCOPE

This specification covers detailed procurement requirements for high reliability silicon planar diodes. These devices are suitable for use in space vehicles and are capable of operation under the most stringent environmental conditions.

2.0 FAILURE RATES

The acceptance conditions for operational life, storage life, and environmental tests are assured by actual test. The estimated failure rate in conservatively designed circuits is based on engineering judgment and the relationship to devices actually tested by Fairchild. These tests indicate the feasibility of attaining a failure rate better than .001% per thousand hours. The vendor is not required to demonstrate this failure rate on devices shipped.

3.0 APPLICABLE DOCUMENTS

3.1 Testing Procedures: Test procedures shall conform to MIL-S-19500 and MIL-STD-750.

3.2 Sampling Procedures: Sampling procedures used are per MIL-S-19500, unless otherwise specified.

4.0 MISCELLANEOUS REQUIREMENTS

4.1 Packaging: Devices shall be packed in the vendor's standard package unless otherwise specified on the purchase order.

5.0 QUALITY AND RELIABILITY ASSURANCE PROVISIONS

5.1 100% Processing Steps: See Table II.

5.2 Normal Lot Acceptance: Each lot of devices shipped shall meet the requirements of Table III, Group A Inspection. Parts purchased as 1N3600-1 or 1N3600-3 shall be accompanied by attribute data; those purchased as 1N3600-2 or 1N3600-4 shall be accompanied by variables data. The data supplied is from the latest production lot submitted to Table IV Group B Inspection.

6.0 DEFINITIONS

6.1 LTPD (Lot Tolerance Percent Defective): This parameter of a sampling plan is the maximum percent defective which will be accepted by the sampling plan with 90% confidence.

6.2 Burn In: Devices which are ordered as 1N3600-3 or 1N3600-4 will have been operated for 100 hours as listed in Table II, prior to Group A inspection.

TABLE I

Part Number	Option (See paragraph 5.2)
1N3600	Units supplied without data.
1N3600-1	Units supplied with data summary by attributes.
1N3600-2	Units supplied with variables data and statistical summary.
1N3600-3	Units supplied with 100-hour burn-in as a process step and with data summary by attributes.
1N3600-4	Units supplied with 100-hour burn-in as a process step and with variables data and statistical summary.

TABLE II — 100% PROCESSING

Test	Examination or Test	Conditions
1	High Temperature Stabilization	200°C min., 48 hours min.
2	Temperature Cycle	10 cycles 175°C to -65°C
3	Hermetic Seal	Hydraulic pressure of 100 PSIG for 2 hours (alcohol, water, and dye)
4	100-Hour Burn-In (See note below)	$V_{RMS} = 36$, $I_o = 200$, $T_A = 25^\circ\text{C}$

NOTE: 1N3600-3 and 1N3600-4 only.

TABLE III — GROUP A INSPECTION

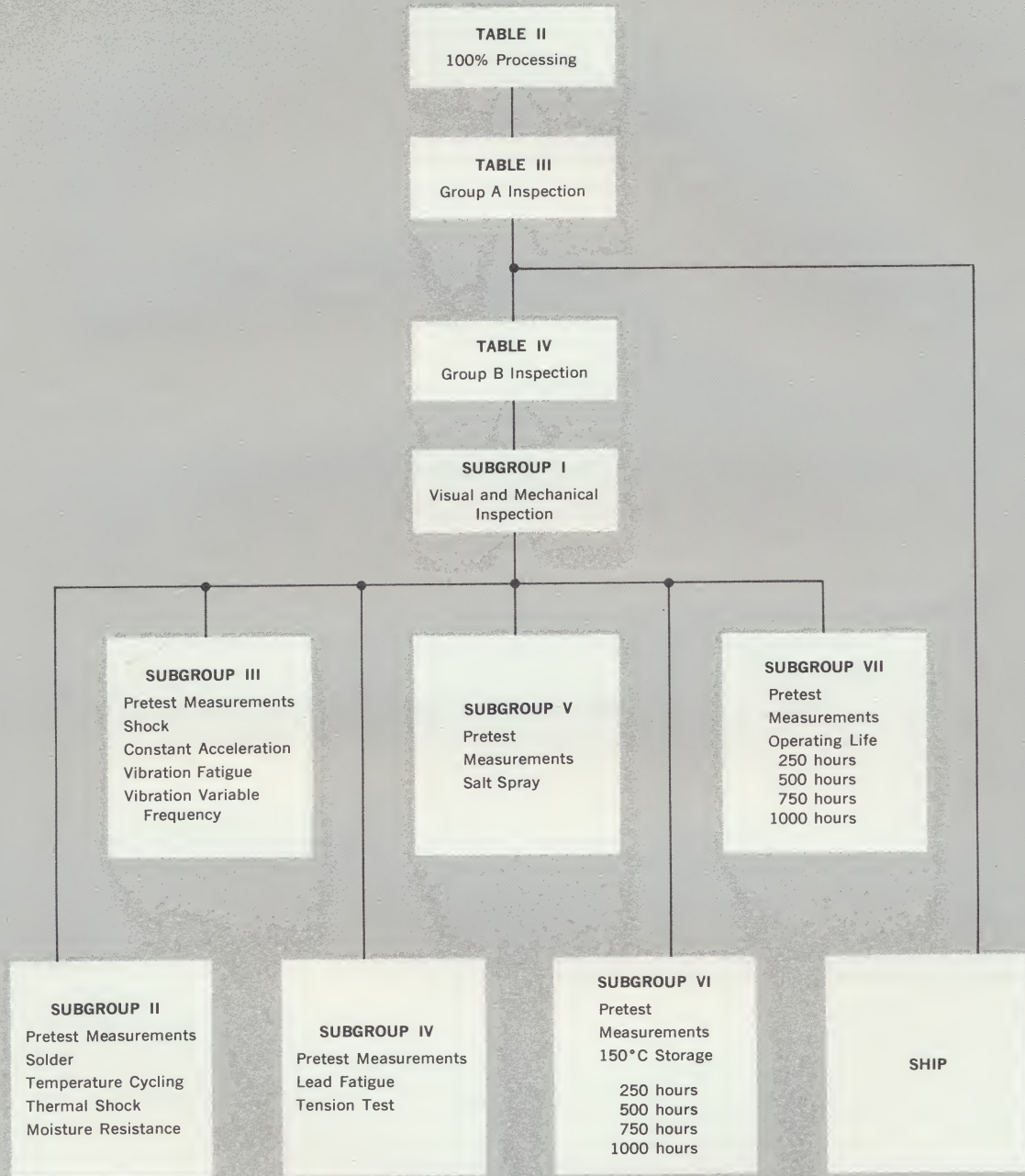
ELECTRICAL CHARACTERISTICS (25°C unless otherwise noted)

SYMBOL	CHARACTERISTICS	LIMITS		Units	SAMPLING LTPD (λ) %	TEST CONDITIONS	MIL-STD Ref. Method
		Min.	Max.				
SUBGROUP I					5		
Visual and Mechanical examination							2071
SUBGROUP II					3		
V _{F1}	Forward Voltage	.87	1.0	Vdc		I _F = 200 mAdc	4011
V _{F2}	Forward Voltage	.82	.92	Vdc		I _F = 100 mAdc	4011
V _{F3}	Forward Voltage	.76	.86	Vdc		I _F = 50 mAdc	4011
V _{F4}	Forward Voltage	.66	.74	Vdc		I _F = 10 mAdc	4011
V _{F5}	Forward Voltage	.54	.62	Vdc		I _F = 1.0 mAdc	4011
I _{R1}	Reverse Current	—	0.1	μ Adc		V _R = 50 V	4016
I _{R2}	Reverse Current		100	μ Adc		V _R = 50 V T _A = 150°C	4016
C	Capacitance	—	2.5	pf		V _R = 0 f = 1 mc	4001
t _{rr1}	Reverse Recovery Time	—	4	nsec		I _F = I _R = 10 mA to 200 mA R _L = 100 ohms i _{rr} = 0.1 I _F	4031 Condition B
t _{rr2}	Reverse Recovery Time	—	6	nsec		I _F = I _R = 200 mA to 400 mA R _L = 100 ohms i _{rr} = 0.1 I _F	4031 Condition B
t _{fr}	Forward Recovery Time	—	10	nsec		I _F = 200 mA t _p = 100 nsec V _{fr} = 1.0 V t _r ≤ 0.4 nsec	4026

TABLE IV — GROUP B INSPECTION

MIL-STD-750 Ref. Para.	Examination or Test	Conditions (T _A = 25°C, unless otherwise specified)		Min. Sample Size	Min. Accept No.	
2066 & 2071	Subgroup I Visual and Mechanical Examination			260	0	
2026 & 2031	Subgroup II Solder	15 seconds immersion @ 230°C		25	0	
1051 Condition C	Temperature Cycling	−65°C to +200°C, 10 cycles, 25 minutes @ extreme cycle				
1056 Condition A	Thermal Shock	Water @ 0°C to 100°C, 10 cycles, 30 sec. @ extreme cycle				
1021	Moisture Resistance	MIL-STD				
2016	Subgroup III Shock	3 planes; 3 blows per plane; 0.5 mSec 1500 G		25	0	
2006	Constant Acceleration	20,000 G, orientation of X _i , Y _i , Z _i , and Z _i				
2046	Vibration Fatigue	20 G, 40 CPS, 96 hours, 3 orientations				
2056	Vibration Variable Frequency	100-2,000-100 CPS, 20 G peak acceleration, 3 orientations				
2036 Condition E	Subgroup IV Lead Fatigue	1 pound, 3-90° arcs		25	0	
2036 Condition A	Tension Test	3-pound weight for 30 seconds				
	Seal Test	100 PSIG hydraulic test, 2 hours				
1041 & 1046	Subgroup V Salt Spray	MIL-STD		25	0	
1031	Subgroup VI High Temperature Life	T _A = 150°C, 1000 hours		80	1	
1026	Subgroup VII Operational Life	V _{RMS} = 36, I _O = 200 mAdc		80	1	
	End Points: Subgroups II through V:		Symbol	Limits		Unit
				Min.	Max.	
4011	Forward Voltage	I _F = 200 mAdc	V _F	.870	1.0	Vdc
4016	Reverse Current	V _R = 50 V	I _R		0.1	μAdc
4001	Capacitance	V _R = 0, f = 1.0 mc	C		2.5	pf
	End Points: Subgroups VI and VII:					
4011	Forward Voltage	I _F = 200 mAdc	V _F	.850	1.05	Vdc
4016	Reverse Current	V _R = 50 V	I _R		0.15	μAdc
4001	Capacitance	V _R = 0, f = 1 mc	C		3.0	pf

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